Generative Adversarial Networks in Time Series: A Systematic Literature Review

Abstract

Generative adversarial network (GAN) studies have grown exponentially in the past few years. Their impact has been seen mainly in the computer vision field with realistic image and video manipulation, especially generation, making significant advancements. Although these computer vision advances have garnered much attention, GAN applications have diversified across disciplines such as time series and sequence generation. As a relatively new niche for GANs, fieldwork is ongoing to develop high-quality, diverse, and private time series data. In this article, we review GAN variants designed for time series related applications. We propose a classification of discrete-variant GANs and continuous-variant GANs, in which GANs deal with discrete time series and continuous time series data. Here we showcase the latest and most popular literature in this field—their architectures, results, and applications. We also provide a list of the most popular evaluation metrics and their suitability across applications. Also presented is a discussion of privacy measures for these GANs and further protections and directions for dealing with sensitive data. We aim to frame clearly and concisely the latest and state-of-the-art research in this area and their applications to real-world technologies.